Bradford and Airedale
Community Health Services

Guidelines for Children in the Community requiring Long Term Ventilation

Responsible head of service:	**Simon Long**
Name of responsible committee:	**Professional Advisory Sub- Committee**
Name of author:	**Erky Radic Clinical Lead Childrens Community Specialist Services BACHS**
Contact for further details:	**Erceline.radic@bradford.nhs.uk**
Version:	**2**
Supersedes:	**Guidelines – Care of a Child Requiring Long-Term Ventilation (2006)**
Date approved:	**October 2010**
Review due:	**September 2012**
Key words:	**Ventilation, children, community**
Document type:	**Guidelines**

If you are using a printed copy of this document please be aware that it may not be the latest version. To view the latest version visit nww.bradford.nhs.uk/extranet/Policies/Pages/default.aspx

NOTE 1: All clinical guidelines remain valid until notification of an amended policy is placed on the intranet.

CONTENTS

section	topic	page
1.	Introduction	**4**
2.	Key related documents	**4**
3.	Equality and diversity	**4**
4.	Definition of client group	**4**
5.	Definition of long term ventilation	**4**
6.	Indications for long term ventilation	**4**
7.	Assessment for long term ventilation	**5**
8.	Training and supervision	**6**
9.	Transition from paediatric to adult services	**7**
10.	Audit	**8**
11.	Assembling a ventilator wet circuit	**9**
12.	Assembling a ventilator dry circuit	**12**
13.	Cleaning a mask ventilator circuit (reusable)	**14**
14.	Cleaning a tracheostomy ventilator circuit reusable (wet & dry)	**15**
15.	Administration of Nebuliser through a ventilator circuit	**16**
16.	Safe use of battery packs	**17**
17.	Safe management of a child during power failure	**19**
18.	Safe management of a child during outings	**20**
19.	Cleaning a Bivona tracheostomy tube	**21**
20.	References	**23**
Appendix 1	Development of guidelines/ consultation	**25**

Appendix 2	Clinical waste management	**27**
Appendix 3	Hazardous waste regulations	**30**
Appendix 4	Procedure for bagged clinical waste in the community	**31**
Appendix 5	Pictorials of different circuits	**33**
Appendix 6	Checklist to go on outings	**36**
Appendix 7	Example of care pathway	**38**
Appendix 8	Example of care plan	**41**
Appendix 9	LTHT Ventilation teaching pack	**44**
Appendix 10	Competencies	**52**
Appendix 11	Checklist for overnight visits	**54**
Appendix 12	Equality impact assessment	**55**
Appendix 13	Procedural document checklist	**58**

1. Introduction and Background

Long term non invasive ventilation in the community setting is not a new concept within Bradford and Airedale. This service has been provided by childrens specialist services for over 8 years. In order to ensure these children and their families continue to receive high quality care there needs to be clear guidance and support for staff and professionals working within Bradford & Airedale Community Services (BACHS).

Scope of the policy staff working with in the BACHS children's specialist services

2. Key related Documents

- National Service Framework for Children, Young People and Maternity Services
- Disabled Children and Young People and those with Complex Health Needs (standard 8)
- Care Pathway Long Term Ventilation
- National Framework for Children and Young People's Continuing Care

3. Equality and Diversity

This policy aims to meet the diverse needs of our service, population and workforce, ensuring that none are placed at a disadvantage over others. It will assist in maintaining patient safety equally across the whole of the BACHS by utilising one nationally approved system.

Furthermore, it has been developed and will be reviewed on the basis that it does not discriminate and is not prejudicial on the grounds of disability, gender, marital status, sexuality, colour race, nationality, ethnic origin, religious belief or age.

4. Definition of the client group

Any child/ young person (0-19 years) who requires ventilation or long term ventilation will need access to services to support them in their daily care.

5. Definition of Long Term Ventilation

'Any child who when medically stable, continued to need a mechanical aid for breathing which may be acknowledged after a failure to wean, 3 months after the institution of ventilation (Jardine & Wallis 1998 from the Childrens Long term Ventilation Working party.) cited in Noyes & Lewis (2005).

6. Indications for Long Term Ventilation

The main indications for long term ventilation in children are highlighted below but this is not an exhaustive list

Box 1 Indications for long-term ventilation (adapted from Samuels, 1996)

High cervical trauma
- Road-traffic accident
- Birth injury
- Non-accidental injury

Neuromuscular disease
- Spinal muscular atrophy
- Congenital myopathy
- Leigh's disease
- Duchenne Muscular Dystrophy

Congenital Central Hypoventiltion Syndrome (CCHS) (Ondine's)

Infection
- After encephalitis or myelitis

Tumour, after surgical resection

Congenital brain malformation
- Arnold-Chiari
- Vascular malformations

Chronic lung disease
- Bronchopulmonary dysplasia
- Cystic fibrosis

Airway obstruction
- Congenital malformations
- Morbid obesity

taken from Noyes & Lewis (2005) From Hospital to Home: Guidance on Discharge Management and Community Support for Children using Long Term Ventilation. (p1)

7. Assessment for appropriate Ventilation

There are many different types of ventilation available. The Paediatric Ventilation/ Respiratory Consultant and his team which will include the Childrens Long Term Ventilation Nurse Specialist (CLTVNS) will assess the child's condition and this will dictate the most appropriate form of ventilation. The parents/ carer will be closely involved in discussions around the most appropriate means of ventilation.

The most common types of ventilation used in Bradford & Airedale are face mask ventilation (non invasive) and tracheostomy ventilation (invasive)

8. Training & Supervision

8.1 Roles and responsibilities

It is the responsibility of the Service Manager to ensure the operational implementation of this guideline and associated policies and any subsequent amendments made following care planning reviews.

Service Managers are responsible for ensuring that the guideline is made available to all staff working in childrens community specialist teams and other teams where there is a child with a long term ventilation need and for ensuring their practice complies with this guideline.

The Team Leader is responsible for highlighting the importance of the guideline to all staff through induction and regular training and for monitoring the implementation of the guidelines.

All BACHS staff caring for children requiring long term ventilation must follow these guidelines. Nursing Staff including health support workers must report problems or issues to the Team Leader or nurse in charge. Out of hours problems should be reported to the on call manager. Problems/issues should be reported on the incident reporting system- PRISM.

It is the responsibility of the Childrens Community Specialist services Team (CCSST) to ensure all staff employed by BACHS who support children with requiring long term ventilation will have access to the appropriate training programme with competency based sessions assessment (appendix 10). The Clinical Lead will work with the appropriate specialist professional representative who will deliver practical training on a regular basis at least annually via the in house mandatory training sessions and at other times as requested - usually every 12 weeks in order to capture as many staff as possible.

The training programme is reviewed on an annual basis and coordinated by the Clinical Lead for Childrens' Community Specialist Services Team (CCSST) who will also work collaboratively with the CLTVNS, Adult Health Leads within BACHS as well as the Acute Trust Paediatric Practice Development Teams.

The CLTVNS will work collaboratively with parents/carers and the CCSST to ensure advice and support is ongoing.

The registered staff within the CCSST e.g. Clinical Lead, qualified nurses, and physiotherapists will work alongside the healthcare support staff to ensure they receive ongoing training, and support on an annual basis as they support children in the community setting who require long term ventilation.

The CCSST has an in house mandatory training database, all support staff have competency booklets and the Clinical Lead will have access to these in order to ascertain who has or has not undergone training and who has up to date competencies.

The training theory sessions feedback forms will also provide information on the appropriateness of training in an attempt to meet the needs of the team.

It is the responsibility of the child's named nurse to ensure that fire safety checks have been completed by the fire brigade and the nurse will inform the relevant utility company. The family receive ongoing support and appropriate training post discharge from hospital by appropriate professionals including the CLTVNS and members of the CCSST.

It is the responsibility of the appropriate hospital professional to ensure parents and family carers have the appropriate training pre discharge to enable the child to be looked after safely at home.

It is the responsibility of the appropriate professional from the CCSST to ensure parents/ carers receive appropriate and timely training to ensure they reach the required standard to enable them to care for their child safely at home.

9. Transition from Paediatric to Adult Services

We are now beginning to see that children/ young people with high dependency and complex health needs are living into adulthood. The process of transition can begin between the ages of 12-19 although there is no hard and fast rule as to when transition should start (Royal College of Physicians Transition Steering Group (2008).

The Children's Specialist Services Team have agreed that transition needs to be considered about a year in advance of actual discharge from the CSST service to ensure transition is managed smoothly for the young person, family, and healthcare nursing team. The Team will make contact with the relevant Adult District Nursing Team (ADNT) or other adult service prior to transition to arrange this in a timely manner.

9.1 Actions to take into consideration

- Contact list of those involved in an individual young person's care, e.g. Paediatricians, Speech & Language Therapist (SLT), Dietician, and School Nurse should be given to the relevant ADNT or service taking over care.

- Equipment – this is often non stock ordering and is bespoke to individuals – it is important that the ADNT relevant professional from adult services are given relevant order numbers and relevant information form the CCSST and can clearly identify via the manufacturer any non stock ordering systems and that the manufactures provide 'alternatives 'for items which do not meet the young person's needs as this will reduce upset and anxiety for young persons families and staff.

- Ordering system – The ADNT/ service responsible for individual's care will be responsible for ensuring adequate stock items, emergency or otherwise are available prior to hand over to cover ordering problems.

- Finance – early discussions with the appropriate ADNT/ service line manager for new patients being transferred to their services will ensure there is a cost code for non stock ordering, and reduces risk of cost not being transferred in time.

- Emergency equipment – should be made readily available by the ADNT/ service and held with the patient at the agreed place of care delivery, consider ordering extra pieces of kit.

- Training and education –The ADNT/ service can link in with the CCCST and undertake appropriate training to reach the required standard. When undertaking care of young person prior to transfer, professionals will establish what the young person and family are able to do and provide appropriate support and develop a joint plan of care for the individual patient. Training will be time limited to minimize duplication of work and ensure clarity of roles. How will staff know how to access and who do they contact e.g. part of induction??

- Out of hours – It is the responsibility of the ADNT service to make their own local arrangements for out of hours support as regards support with the ventilator this can include contact numbers for the Leeds Ventilation Service being made available to staff and patients.

10. Audit

The attendance of staff and any other agencies who have received training is recorded and held within the CCSST and each session is evaluated by the attendees and will be used to annually audit which staff attend training in a twelve month period.

Care plans will be audited on an annual basis to look at content of information e.g. emergency procedures, documentation of any changes to the amount of ventilation being given and cross referenced with the documentation audit.

The Prism reporting system will also be audited to look at types of incidents reported in relation to oxygen therapy and care.

11. Assembling a ventilator circuit for use with a Fisher Paykell Humidification system (wet circuit)

NB: Normally non sterile latex free gloves are used for these procedures. Local Trust risk assessment procedures must be followed and practitioners and patients who may be allergic to latex must be supplied with an alternative to latex and follow local Trust guidelines for latex allergy.

Action	Rationale
1. Establish the need to change the ventilation circuit (once weekly). This will be indicated on the child's ventilation checklist.	• To ensure the task needs to be undertaken.
2. Establish whether this is to be done by 1 or 2 people (this will be dependant on the child's ability to self ventilate and will be indicated in the child's care plan).	• To ensure the safety of the child throughout the procedure.
3. Wash hands thoroughly in accordance with local PCT hand hygiene policy.	• To minimize the risk of cross infection.
4. Apply alcohol gel to hands leave to dry before touching equipment.	• To ensure hand are 'socially clean' and reduce risk of infection.
5. Ensure all equipment/ components are available as follows ▪ Bacterial filter ▪ Circuit ▪ Humidifier dome ▪ Humidifier ▪ Ventilator and mains lead ▪ Exhalation port ▪ Heater/humidifier wires ▪ Oxygen port (if required) ▪ Swivel elbow ▪ Water for irrigation ▪ Prescribed ventilator settings	• To enable the task to be completed.
6. Explain the procedure to the	• To provide reassurance and gain the

child & family.	Child's cooperation where possible.
7. Prior to changing the circuit assess the child to ensure they are adequately ventilated / oxygenated by other means (e.g. Self inflating resuscitation bag/ alternative circuit/ oxygen mask/ Thermovent).	• To ensure adequate ventilation/ oxygenation is maintained throughout the procedure.
8. Ensure sufficient monitoring and observation of the child during procedure	• To detect signs of oxygen desaturation and deterioration To prevent burns/scalds.
9. Switch humidifier and ventilator off-beware of the heating element on the humidifier which will be hot- and remove circuit to be replaced.	• To prevent burns and scalds • To allow clean circuit to be assembled
10. Wash hands in accordance with local PCT hand hygiene policy. 11. Apply alcohol gel to hands leave to dry before touching equipment.	• To ensure correct assembly of circuit and prevent risk of cross infection. **NB: ventilator should be higher than humidifier when in use and humidifier lower than child's tracheostomy, to prevent water entering either ventilator or tracheostomy.**
12. Assemble the clean circuit as shown in Pictures 1 and 2 of Appendix A.	• To ensure correct assembly of equipment.
13. Protect all endings and avoid contamination (minimal handling of ends)	• To minimize risk of infection and prevent contamination
14. Wipe all equipment with a clean damp cloth & clean the airway temperature probe in accordance with manufactures guidelines.	• To minimize risk of infection and prevent contamination.
15. Connect the new system to the ventilator and humidifier.	

16. Switch humidifier and ventilator on and check prescribed settings – ensure pressures are achieved when the swivel Elbow is occluded.	• To ensure the ventilator is working and pressures are achieved.
17. Attach the ventilator to the child and ensure child is comfortable.	• To resume ventilation • To enable child to rest and recover from the procedure.
18. Clean ventilator circuit according to manufactures guidelines.	• To ensure circuit is ready for next change.
19. Wash hands in accordance with local PCT hand hygiene policy.	• To minimize risk of cross infection
20. Complete documentation as appropriate.	• To ensure continuity of care and ensure events are recorded.

12 Assembling a ventilator circuit without a Fisher Paykell Humidification System (dry circuit)

Action	Rationale
1. Establish the need to change the ventilation circuit (once weekly). This will be indicated on the child's ventilation checklist.	▪ To ensure task needs to be undertaken.
2. Establish whether this is to be done by 1 or 2 people (this will be dependant on the child's ability to self ventilate and will be indicated in the child's care plan).	• To ensure the safety of the child throughout the procedure.
3. Wash hands thoroughly in accordance with local PCT hand hygiene policy.	• To minimize the risk of cross Infection.
4. Ensure all components are available as follows: ▪ Circuit ▪ Ventilator and mains lead ▪ Exhalation port ▪ Oxygen port (if required) ▪ Swivel elbow ▪ Prescribed ventilator settings ▪ Heat and moisture exchange filters	• To enable the task to be completed.
5. Explain the procedure to the child & family	• To provide reassurance and gain the child's cooperation where possible.
6. Prior to changing the circuit ensure the child is appropriately ventilated/ oxygenated by other means (e.g. Self inflating resuscitation bag/ alternative circuit/ oxygen mask/ Thermovent).	• To ensure adequate ventilation/ oxygenation is maintained throughout.
7. Wash hands in accordance with local PCT hand hygiene policy	• To ensure correct assembly of

8. Assemble the circuit as shown in pictures 3, 4 and 5 in Appendix A	circuit and prevent risk of cross infection.
9. Protect all endings and avoid contamination.	• To minimize the risk of cross infection and prevent contamination.
10. Check prescribed settings and switch ventilator on – ensure pressures are achieved when the swivel elbow is occluded.	• To ensure the ventilator is working and pressures are achieved.
11. Attach the circuit to the child and ensure they are comfortable.	• To resume ventilation.
12. Document completion of the task on the checklist.	• To ensure contemporaneous documentation.
13. Wash hands in accordance with local PCT hand hygiene policy.	• To minimize risk of cross infection
14. Clean ventilator circuit according to manufactures guidelines.	• To ensure circuit is prepared for next change.

13. Cleaning of mask ventilator circuit (re-useable) – wet and dry circuits

Action	Rationale
1. Wash hands in accordance with local PCT hand hygiene policy and wear non sterile latex free gloves.	• To minimize the risk of cross infection. • To enable the task to be completed safely.
2. Remove circuit from ventilator and disconnect from mask and headgear	
Weekly ▪ Wash circuit and mask in hot water and washing up liquid, rinse thoroughly with cold water and dry thoroughly with disposable paper/ kitchen towels and hang to drip dry	▪ To keep circuit clean and minimise risk of infection. ▪ Do not dry with a towel
Daily ▪ Empty water out of humidifier dome and leave disconnected from circuit to dry (omit for a dry circuit)	▪ To keep circuit clean and minimize risk of infection.
▪ Wipe mask using a wet cloth (using washing up liquid in water), then wipe again with cloth and plain water.	
3. Re assemble when dry following standard precautions re strict hand washing.	• To ensure correct assembly of circuit and prevent risk of cross infection.
4. Check prescribed settings and switch ventilator on – ensure pressures are achieved when the mask is occluded.	• To ensure the ventilator is working and pressures are achieved.
5. Attach the circuit to the child when needed and ensure they are comfortable.	• To resume ventilation.
6. Wash hands in accordance with local PCT hand hygiene policy.	• To ensure contemporaneous record keeping. • To minimize risk of cross infection
7. Document completion of the task on the check list.	• To ensure contemporaneous record keeping.

14. Cleaning of tracheostomy ventilator circuits (re-usable) – wet and dry circuits.

Action	Rationale
1. Wash hands in accordance to local PCT hand hygiene policy and wear non sterile latex free gloves.	• To minimize the risk of cross infection.
2. Remove the circuit from ventilator once the child's safety has been established as per assembling circuit guideline	• To enable the task to be completed safely.
3. Discard: ▪ HMEF (dry) ▪ Bacterial Filter (wet) ▪ Humidifier Dome (wet) ▪ Swivel Elbow (both) ▪ Exhalation Port (both) ▪ Oxygen Port (both) Disconnect: ▪ Heater Wires (wet)	• To minimize the risk of infection
4. Immerse the circuit in hot water and an appropriate cleaning solution (mild detergent such as washing up liquid or Kapitex cleaning powder; or an acetic acid solution)	
5. Submerge the circuit in a bowl designated for this purpose, ensuring the solution reaches all parts and soak for 20 minutes.	▪ To soften and remove built up dirt.
6. Rinse thoroughly in cold water.	▪ To remove soapy residue.
7. Dry thoroughly with disposable paper/ kitchen towels and hang up to drip dry. Store in designated container with lid.	▪ To prevent risk of legionnaires disease and to keep clean. ▪ Do not dry with a towel
8. Wash hands in accordance to local PCT hand hygiene policy	▪ To minimize risk of cross infection
9. Document completion of task on check list.	▪ To maintain contemporaneous record keeping.

15. Administration of a Nebuliser through a ventilator circuit.

Action	Rationale
1. Wash hands in accordance with local PCT hand hygiene policy. 2. Put on non sterile latex free gloves	• To reduce the risk of cross infection. • To ensure safe administration.
3. Check and prepare drug according to local and Trust policies and procedures for administration of medication.	• To reassure and gain the child's cooperation where possible
4. Explain the procedure to the child & family.	• To prevent it alarming during the procedure
5. Silence the ventilator.	• To ensure the nebuliser chamber is correctly placed in the circuit.
6. Put the drug in the nebuliser chamber and attach the T piece on the top as shown in Picture 6 in Appendix A.	**NB** Nebuliser chambers must never be connected directly to a tracheostomy, always use the T piece
7. Place the nebuliser and T piece in the ventilator circuit as shown (i.e. after the swivel elbow and before the exhalation port).	• To administer drug and to detect any problems.
8. Switch on the nebuliser and reactivate the alarm. **NB** If on dry circuit remember to remove the HMEF.	• To resume normal ventilation
9. When the nebuliser is complete – disconnect the T piece and nebuliser chamber from the circuit and reconnect to patient. **NB** If on a dry circuit remember to replace the HMEF.	
10. Rinse the nebuliser chamber and T piece in water and leave to dry	• To remove any traces of the drug
11. Wash hands in accordance to local PCT hand hygiene policy	• To minimize risk of cross infection
12. Document task in case notes	• To maintain contemporaneous record keeping.

16. Safe use of Battery Packs – Nippy Junior / 3

Action	Rationale
1. In the home environment the child on tracheal ventilation requires at least one battery pack for each BiPAP ventilator.	• Safety equipment is necessary for possible power failure
2. Equipment needed	• To enable task to be completed
▪ Lead acid battery with cable to charger unit and cable to round vent connector, in blue or black carry bag ▪ Charging unit with mains lead in mesh pocket of carry bag	See picture 8 in Appendix A
3. General Handling Instructions	• Comments
▪ Always ensure that the batteries are stored in a dry place that is suitable for supporting their weight	▪ Nippy batteries weigh 5kgs so may be used on most standard pushchairs – refer to manufacturer
▪ If the batteries have not been used for a few days as the child has not been out, they should be checked to ensure they are in good working order.	▪ Nippy batteries should be checked once a week by running the ventilator on them for 5 mins and observing 'full' battery sign on screen – charger must be turned off for this test
▪ Ensure no liquids or rain can spill on the battery, use protective bags provided at all times	▪ To avoid a short circuit
▪ A fully charged battery will power the ventilator for approximately 3-4 hours (small battery) or 6-8 hours (large battery) depending on the pressures used.	▪ This time reduces with the battery life and there are no means of testing.
▪ It is essential to turn off the mains power supply whenever you are attaching or removing the battery from the charger AND/OR ventilator.	▪ To prevent sudden power surges that may cause the fuse to blow.
▪ Ensure all cables are secured and do not 'tangle' at the side of the chair.	▪ To prevent breakage of cables and battery disconnection
▪ Low battery power - the alarm will sound and 'Low battery power' will be displayed. Silence the alarm to acknowledge and there may be up to 20 minutes power left	▪ Do not rely on time left, obtain alternative power source immediately and fully charge the used battery to ensure readiness for emergency use.
▪ It is good practice to leave the battery connected to the bedside ventilator and charging at all times	▪ To ensure automatic battery supply in power cut

4. Charging ▪ It is essential to plug in the charger lead before switching on the mains power supply. ▪ The indicator will show a YELLOW light when the battery is correctly connected and is being charged. ▪ The indicator will show a GREEN light when the battery is charged and ready for use, leave connected in this state for best results.	▪ To prevent a power surge **NB:** DO NOT 'BOOST' A BATTERY AS IT IS OF NO BENEFIT. WAIT UNTIL THE GREEN LIGHT SHOWS. IF IN DOUBT OF FUNCTION, CHARGE FOR AT LEAST 24 HOURS **NB:** The green light is not a reliable indicator of battery state.
5. <u>WARNINGS</u> ▪ Do not cover the charger when in use (may be left in mesh pocket) ▪ Batteries may produce explosive gases during charging ▪ For best results charge batteries at room temperature ▪ The charger is designed for indoor use, do not expose to rain or damp. ▪ Check routinely that the power supply lead is in good condition and that the charger is earthed. ▪ The power supply should be protected by a 3 Amp fuse.	▪ To prevent over heating ▪ Charge away from sparks / do not smoke near battery whilst charging ▪ Check all wiring is well insulated ▪ Never pull on any wires.
6. <u>Connecting the Battery</u> ▪ Switch mains off and disconnect the battery from the power supply ▪ Connect the round connector to the Aux power input at the back of the Nippy Junior / 3.	See picture 8 in Appendix A
▪ Turn the vent on. The Ext Batt light will flash and the alarm will sound, displaying 'running on battery power'. Mute the alarm to acknowledge. The display will show a battery if vent switched on.	▪ There is no need to switch the vent off if in use, unplug the mains power supply and the vent will switch over to battery power.
▪ To disconnect the battery, switch the vent off, press the plug release button on the connector and pull out.	▪ If vent in use, attach a mains lead and power supply will switch to this so the battery can be removed.

17. Safe management of child during power failure

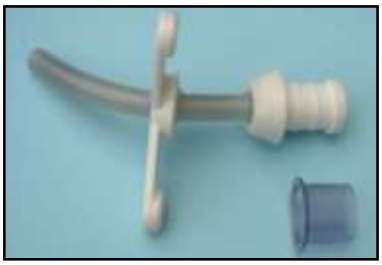
Action	Rationale
1. Always ensure that there is a working torch available close to the child during the night	• To be able to see in event of power failure
2. In the event of power failure:	
▪ Nippy Junior / 3 Ventilator will alarm and switch over to external battery supply if connected, acknowledge alarm.	▪ Ensure second battery is available should the power cut last longer than a few hours
▪ Nippaed Ventilator will alarm and stop working immediately, CALL FOR HELP and manually ventilate / wake child up	▪ Change to battery supply until power is restored.
▪ Saturation Monitor will automatically switch over to the internal battery back up (approx. one hour of continuous use)	▪ Carry out spot checks on the child saturations unless there is concern about the child's colour or condition.
▪ Fisher Paykel Humidifier will stop working. If the power cut lasts more than an hour consider changing to portable ventilator circuit with green HME in circuit.	▪ Consider saline nebulisers if prolonged power cut.
▪ Portable Suction Unit will work on internal battery back up (approx. one hour of continuous suction)	▪ Use intermittently, if battery runs out use manual hand pump if suction is needed
▪ Portable Nebuliser will not work. Connect nebuliser to oxygen cylinder using green tubing.	▪ Nebulise 2-3 hourly until power supply is restored.
▪ Oxygen concentrator will stop working, switch to cylinders.	▪ Calculate number of hours supply in cylinders to determine when to move the child to hospital (see formula in Appendix B)
3. If the power is not reconnected within 4 - 6 hours, contact the Local Hospital for admission.	• To provide adequate power supply to the child's equipment, and maintain their safety.

18. Safe management of a child during outings

Action	Rationale
1. Both the parents and the carer of the child must agree that the child is clinically well to be taken on an outing, and consent given.	• To maintain safety of the child. There are no legal restrictions in taking the child out if consent has been obtained from parents.
2. (Health support worker to seek advice from qualified nurse.)	• To maintain safety of child.
3. The nurse / carer or parent accompanying the child must have completed all relevant training and be competent in the care of the child, all equipment as well as basic life support skills.	• All training must be documented to ensure child's safety
4. The outing must occur in a rostered shift, or nurse/carer MUST flex on duty or work a bank shift for that period.	• There is no break in contract and therefore they are covered by the Trust's liability insurance policy.
5. Equipment: ▪ Prepare the equipment as listed on the Checklist for Outings (Appendix B). ▪ Prepare the ventilator according to guidelines for changing onto a 'dry' circuit and using battery packs. ▪ Calculate the required amount of oxygen for the outing and ensure sufficient oxygen supply.	• To ensure appropriate equipment available for duration of outing, see attached checklist for outings and relevant guidelines.
6. Ensure the child's emergency equipment is kept near the child and is accessible at any time (e.g. Do not enter a lift or taxi without them).	• To enable emergency care to be administered at all times.
7. Use wheelchair accessible taxi's	
8. Ensure appropriate car seating and safety belts are in place and used.	• To ensure safe transfer of child and to comply with moving and handling requirements.
9. Ensure oxygen is in an appropriate carry case or secured appropriately	• To ensure safety of child and staff

when in vehicle. 10. For longer outings such as daytrips and home visits see Checklists for Overnight Visits (Appendix C) 11. Prepare enough equipment and materials that will ensure the child's safety should significant delays occur during the outing. 12. In case of battery failure despite calculations, take child off vent and allow to self ventilate, or manually ventilate as appropriate. 13. Ensure carer has a working mobile phone with them when taking the child out. 14. **EMERGENCY ACTION** ▪ Should the emergency occur whilst travelling in a vehicle ask the driver to pull over and to stop the car until the situation has stabilized. ▪ If a medical emergency arises, commence resuscitation measures as necessary and RAISE THE ALARM for assistance/ DIAL 999 for an ambulance. 15. Upon return: ▪ The child may rest as necessary. Consider saline nebuliser and return to wet circuit. ▪ The ventilator is reconnected to the mains supply and the battery recharged. ▪ All used equipment will be cleaned, checked and stored as appropriate	• To ensure safe transportation of oxygen. • To ensure all necessary equipment and disposables have been considered. • To ensure safety during delays such as traffic jams / emergency situations • If a long period is anticipated consider phoning 999 for a speedier return. • For communication in all circumstances • To enable emergency procedures to be carried out safely. • The ambulance will take you to the nearest A & E Dept. • To maintain child safety and readiness of equipment for when next needed.

19 Cleaning a Bivona Tracheostomy Tube

Action	Rationale
1. Bivona® tubes are single patient use and can be cleaned and re-used for up to 12 months, date of insertion is recorded in care plan.	• Bivona® tubes are specifically for ventilator dependent children, or those infants with neck access problems, and are reusable.
2. Equipment needed: ▪ Kapitex cleaning kit – cleaning powder and cleaning tub ▪ Kapitex cleaning buds	• The oxygen-based powder breaks down the 'protein plugs' occluding the tube. Buds can be used to remove stubborn secretions at the cannula tip.
3. Procedure: ▪ Wear non sterile latex free gloves and disposable apron ▪ Prepare cleaning solution as per instruction using the empty tub with the 'basket' provided ▪ Rinse the tube under water to remove as much dirt as possible ▪ **Remove the 15 mm connector by using a wedge - do not pull** ▪ Place tube and clear 15 mm connector in cleaning basket, then submerge in prepared cleaning solution ▪ Soak for about 30 min. ▪ Remove the tube and inspect the inner lumen and the outside for any stubborn secretions. ▪ Repeat the soak if tube is not clean. In some cases, you may need to use the cleaning buds. ▪ When clean take tube out of basket and rinse with clean water. ▪ Leave to dry in a clean place. ▪ Re-assemble the tube once clean and dry. ▪ **Store in clean and dry container. Label container with the date when the tubes were started.**	• Remove 15 mm connector before cleaning:  Re-assemble correctly:
▪ Wash hands in accordance to local PCT hand hygiene policy	• To ensure contemporaneous record keeping.

20. REFERENCES

Airedale NHS Trust (2006) Guidelines for Patient with a Tracheostomy tube insitu. ANHST

B & D Electromedical - 35 Shipston Road, Stratford-On-Avon, Warwickshire, CV37 7LN - 01789 721577

Bradford & Airedale Community Health Services (2010) Decontamination & Autoclave Policy. BACHS

Bradford & Airedale Community Health Services (2010) Hand Hygiene Policy & Procedure. BACHS

Bradford & Airedale Community Health Services (2010) Infection Control Standard Precautions Policy. BACHS

Bradford & Airedale Community Health Services (2010) Infection Prevention Management Policy. BACHS

DOH (2010) National Framework for Children & Young People's Continuing Care. London DOH.

DOH, DFES (2005) NSF for Children, Young People & Maternity Services. Long Term Ventilation. London DOH.

Fischer & Paykel - Unit 16, Cordwallis Park, Clivemont Rd, Maidenhead, SL6 7BU, 01628 626136

Great Ormond Street NHS Trust (2005) Clinical Guidelines resource Pack

Intersurgical - Crane House, Molly Millars Lane, Wokingham, RG41 2RZ - 0118 9656300

Kapitex Healthcare Ltd - Kapitex House, 1 Sandbeck Way, Wetherby, LS22 7GH - 01937 580211

Noyes, J. Lewis, M. Barnados. (2005) Hospital to Home: Guidelines on Discharge Management & Community Support for Children using Long-term Ventilation. Barnados.

Nursing & Midwifery Council (2002) Guidelines for Administration of Medicines. London NMC

Portex Ltd - Hythe, Kent, CT21 6JL - 01303 260551

ResMed UK Ltd - 65 Malton Park, Abingdon, OX14 4RX, 01235 862 997

Respironics UK Ltd, Heath Place, Bognor Regis, PO22 9SL, 0870 770 3434
Ventilation. London DOH.

Widdas, D. (2006) Preparation Checklist for Going Out for a long period of time with a Child. Long Term Ventilation Website.

www.kapitex.com

www.longtermventilation.nhs.uk

www.nippyventilator.com

www.ResMed.co.uk

www.respironics.com

Appendix 1

Development of Guidelines

These guidelines were developed by the Clinical Lead from the Childrens Community Specialist Services Team Bradford & Airedale Community Health Services (BACHS) with input from colleagues for other Childrens' community teams a well as colleagues from the acute trust.

Consultation Group

All members of the Professional Advisory Group

Tim Hayward	Paediatric Consultant (PICU) Leeds Teaching Hospital NHS Trust
Sarah Cozens	Children's Long Term Ventilation Nurse Specialist (LTNHST)
Erky Radic	Clinical Lead Bradford & Airedale Community Health Services (BACHS)
Team Leaders	Childrens Community Specialist Services BACHS)
Emma Wilkinson	Clinical Support Specialist (BACHS)
Rachel Lyles	Paediatric Outreach Team Airedale NHS Trust
Rachel Binks	Nurse Consultant Critical Care (Adults) (ANHST)
Fi Knox	Practice Development Sister Paediatrics Bradford Teaching Hospitals Trust
Helen Hartley	Respite Co-ordinator Hunslet Health Centre (HHC)
Joanne Young	Senior Staff Nurse (HHC)
Amanda Barwick	Specialist Nurse Child Health (Kirklees Community Health Services)
Margaret Wadsworth	Manager Forget Me Not Trust Respite Service (Paediatrics)
Adele Thomas	Team Leader Childrens Team Calderdale NHS Trust

Date Written: April 2010

Review Date: April 2012

Objective:
To review working practices.
To liaise with other professionals involved in caring for children who require long term ventilation obtaining expert advice.
To act upon the expert advice obtained and implement accordingly to update clinical practice.
To ensure continuity of care across the acute and community clinical areas in Leeds, Bradford and Airedale.

Clinical Condition: Children who are defined as having a long term ventilation requirement

Target Patient Group: All children who have long term ventilation requirements either in the acute or community setting.

Target Professional Group: All BACHS staff who will be required to care for children with long term ventilation needs.

Adapted from:	Clinical Guidelines for the Transitional Care Unit, October 2002, Netty Fabian and Barbara Boosfiled, Great Ormond Street Hospital for Children NHS Trust and from East Leeds Primary Care Trust: Care of a child requiring long term ventilation (September, 2006).
Recommendations:	To circulate guidelines amongst all members of the team and to ensure guidelines constitute as foundation for all future training.
Benefits for the Patient:	1. To ensure continuity of care of patients across the Acute and Community settings. 2. To ensure care delivered is research based and up to date.

Appendix 2

NHS
Bradford and Airedale
Community Health Services

NHS
Bradford and Airedale

CLINICAL WASTE MANAGEMENT.

OWNERSHIP OF COMPLYING WITH THE LEGISLATION, POLICY AND PROCEDURES FOR CLINCAL WASTE IS YOUR RESPONSIBILITY.

If through your clinical activity you produce some wastes, you personally are defined as a *Waste Producer* under the **Hazardous Waste Regs 2005.** You as a *Waste Producer* have legal responsibilities under this legislation and more under the ***Environmental Protection Act 1990*** and the ***The Environmental Protection (Duty of Care) Regulations 1991***

This means you have a 'cradle to grave' responsibility for the correct segregation of wastes, a completed audit data trail and ensuring correct disposal. This includes any appropriate safety requirements and infection prevention requirements.

Staff who are not waste producers but involved in the disposal or paper records must also adhere to the requirements of law & PCT policies

All staff has a responsibility to report any risks associated with clinical waste to ensure that the risk is managed and made safe.

YOUR WASTE SEGREGATION OBLIGATIONS

You must segregate the wastes correctly for legal, contractual and safety reasons.

You segregation obligations therefore are:

- You make the decision the waste type that you produce goes into the correct colour coded bag or sharps bin and only the correct one.
- You must never mix different classes of waste types in the same bag or sharps bin.
- If you do not know what waste types goes into which bag or bin type – you always check or ask.
- If you have worked previously in an Acute Trust, you must follow the clinical waste policy of this Trust on the segregation and disposal of waste since it is likely to be different.

SEGREGATION EXCEPTION : Some community staff produce small quantities of mixed sharps types. Therefore, these groups of community staff are permitted to use a 0.6 litre purple sharps bin in these circumstances. BUT, the production of large quantities of same type sharps in the community must go into the correct sharps bin type.

MANDATORY AUDIT TRAIL : You must complete the **Labelling Audit Trail** for bags and sharps bins.

- If you open a sharps bin/1st to use it, you must immediately record:
  Location + Service + your name + date opened.
- If you close a sharps bin after being ¾ full, you must write**:**
  your name and date of closure.
- If you have provided a service in a clinical room producing bagged wastes and that bag is closed at the end of the session, you must ensure personally the bag is labelled with:
  Site or Practice name + Clinic name or specific service + waste code + date of closure.

LEGAL PAPERWORK.

As a Hazardous waste producer when YOUR waste is handed over to a disposer, legal paperwork [called a Consignment Note] must be raised accurately recording YOUR waste types. The Consignment Note is supplied by the driver of the collection vehicle and it is signed on your behalf by a competent person (this is a named person who has had instruction).

The Consignment Note is part of the statutory audit trail and what is written on that document must be accurate, hence the need for you to segregate accurately and label bags/bins accurately so this can be recorded on the Consignment Note.

You also need to know where the Consignment Notes are filed and who signs it on your behalf.

WASTE CONTRACTS - CHECK ONE EXISTS.

It is your teams responsibility to ensure a clinical waste collection exists (& the right type of collection contract) prior to moving location or setting up a new service. You need to check this with the Waste Manager (Anthony Jones, Douglas Mill).

A **Pre Audit Questionnaire** from the Waste Manager must also be completed prior to the relocation/new service start to make sure there is a Contract to meet your service needs; otherwise your new/relocated service may not be able to proceed**.**

BASIC OPERATIONAL PROCEDURES

- Bins and bags must never be more than ¾ full.
- You must never place liquids, bottles of liquids (e.g. urine), bottles previously containing drugs, anything that might create a sharp or stool samples into the bags.
- Bins and bags must be securely closed / sealed.
- Closed bins and bags must always be labelled.
- You are required to place closed sharps bins or bags either into a specified dirty utility room or into the correct external waste bin (site dependant).
- Waste from one site must not be taken to other site.
- Community generated sharps and bag wastes must only be returned for disposal at the team's office base.
- Sharps and bag waste transported in a car must always be carried in the approved transport box

WASTES FROM OTHER SITES.

Schools and Community Sites.

- Sharps & Bag wastes placed into the correct container, sealed and labelled.
- Transport these wastes only in the approved transport boxes.
- Dispose these wastes only at your base (check there is a waste contract)

Patient Homes.

- Infected or potentially infectious wastes should have a home collection waste contract set up if in bulk.
- Small amounts can be transported in labelled bags in a transport box back to base.
- Uninfected waste can go in general household waste.

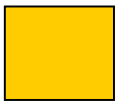
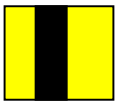
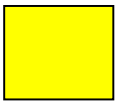
Acute Hospital Sites.

If you provide a service at an Acute/other Trust site, it is your responsibility to follow their policy and procedures. If you have any concerns regarding their procedures, contact infection prevention or the Waste Manager.

Appendix 3

Hazardous Waste Regulations

Quick Reference Segregation Table.

Container colour	NHS Colour Code for bag or bin.	Segregated Material	Code used for the segregated waste	Anticipated Disposal Method
BAGS				
Orange Bag		Low Infectious and potentially infectious healthcare waste excluding body parts	18 01 03	Alternative treatment (Autoclaving)
Yellow Bag		(a) Highly Infectious waste. → (b)Tissues, Body parts (including blood bags and blood preserves) →	18 01 03 18 01 02	Incineration
Tiger Stripe Bag		Offensive wastes. (Nappies, dirty linen, disposable clothing) *NHS guide is use this bag if create more than 7kg of waste otherwise its Trade Waste.*	18 01 04	Landfill
Black Bag		Trade Waste. Standard domestic & office waste after removal of any recyclable components	20 01 03	Landfill
SHARPS				
Orange sharps **(Lid Colour)**		Low Infectious or potentially infectious sharps that do not contain or contaminated with medicines	18 01 03	Alternative treatment
Yellow sharps **(Lid Colour)**		Highly Infectious or Any sharps that contain or are contaminated with non toxic medicines.	18 01 03 18 01 09	Incineration
Purple sharps **(Lid Colour)**		Any sharp that contains or is contaminated with cytotoxic or cytostatic medicines. Examples are hormonal and chemo medicines	18 01 08	Incineration
OTHER HAZARDOUS MATERIALS				
Container for Amalgam waste. (Dental care)	White	Amalgam waste is hazardous from mercury, & to a lesser extent from the other constituents e.g. silver & tin)	18 01 10	Recovery

Appendix 4

Procedure for the disposal of Bagged Clinical Wastes in the Community.

(Procedure for Labelling, Transportation and Disposal).

(A) Small Quantities of bagged clinical waste.

Where small amounts of bagged clinical waste are created in the Community and the quantity is small enough to fit into the currently issued ***Clinical Waste Transport boxes,*** the following procedure will be followed:

1. Use a small strong clear plastic bag, as used in the small office or lavatory bins for paper towels [or you use the appropriately coloured clinical waste bag but insertion into the Transport Box may be an issue. If you do use an orange or yellow clinical waste bag, you follow the labelling and disposal procedure for the below *(B) Large Quantities of bagged clinical wastes* – points 3 to 5.]

2. This bag must not be overfilled so that it will not fit into the Transport Box. [Carrying bagged wastes without being contained in a Transport Box is not permitted legally]

3. The bag must be tied and labelled [*true label or permanent marker pen*] with:

- State waste classification - i.e. orange bag waste or yellow bag waste.
- Location [school/hall etc. name]
- name of nurse (or team if its a teams waste)
- date of closure

4. This mini bag is then taken back to the teams office base and no where else.

5. This small bag is placed directly into the correct coloured clinical waste bag in a room clinical waste bin back or placed into a fresh correctly coloured clinical waste bag, tied & labelled again and placed directly into the correct external clinical waste bin.

(B) Large Quantities of bagged clinical waste

1. Where large quantities of bagged clinical wastes are anticipated to be generated in the Community, the clinician/service will use the appropriately coloured Clinical waste bag [Orange or Yellow] to collect the bag waste.

2. This larger bag will be transport only in the large 22 litre Red Transport rules complaint Bin which has a resealable lid **[This is expected to become available May 2010]**

3. When the service has been completed, the bag will be tied and labelled with:

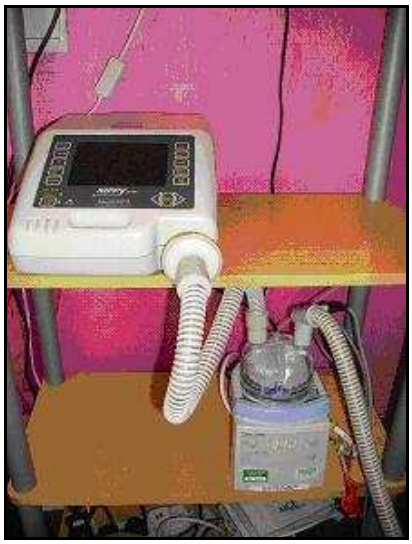
- Location [school/hall etc. name]
- name of nurse (or team if its a teams waste)
- date of closure

4. This clinical waste bag is then transported in the Transport Bin back to the teams office base and no where else.

5. This bag will then be placed directly into the correct external clinical waste bin.

Appendix 5

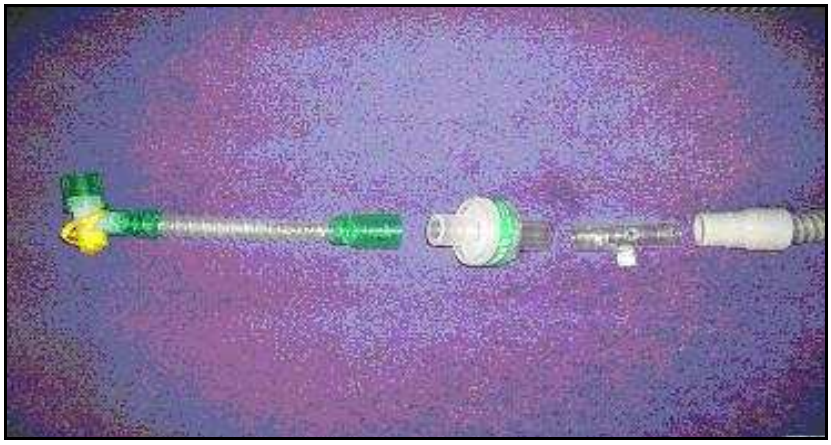
1. Wet Circuit



2. Wet Circuit with Oxygen

3. Dry Circuit

4. Dry Circuit



5. Dry Circuit with Oxygen

6. Nebuliser

7. Nippy Junior / 3 Battery

APPENDIX 6 - CHECKLIST TO GO ON OUTINGS

1. ASSESS THE CHILD AND ENSURE S/HE IS FIT TO GO ON AN OUTING
   Refer to child's individual care plan
   - No restlessness, comfortable breathing
   - Normal O2 saturations
   - Minimum O2 requirements
   - All batteries were fully charged

2. PREPARE EQUIPMENT
   - Emergency bag - essential contents to include
     - Tracheostomy tube same size as in situ
     - Tracheostomy tube one size smaller
     - Scissors, Trachy tape, K-Y Jelly

These items must be kept with the child at all times.

- Self Inflating Resuscitation Bag
- Disposable gloves for suctioning
- Suction catheters
- Yankeur sucker, Normal saline, 5 mls syringes

3. CHECK SUCTION UNIT
   - Ensure the suction unit is fully charged.
   - Check all connections are available to add to suction machine

Remember: The portable suction units last for only 1 hour when used continuously consider taking manual hand pump.

4. CHECK VENTILATOR BATTERIES
   - Ensure fully charged – charger light is green (see MANUFACTURES GUIDELINES AND GUIDELINES FOR CARE OF VENTILATOR BATTERY PACKS)
   - Ensure enough battery life for trip (more than one battery may be needed)
   - Ensure mains lead is available should battery fail and mains point is available nearby

5. DOCUMENTS TO PREPARE
   - Parental consent
   - Information sheet stating Medical Consultant, telephone number, Diagnosis and Resus status
   - Copy of child's individual care plan

6. CHECK OXYGEN REQUIREMENT
   - A full D-size cylinder contains 340 litres
   - How to work out requirements:

$$\frac{\text{Litres in cylinder}}{\text{Litres needed per minute}} = \text{minutes of oxygen available}$$

e.g. $\frac{\text{340 litres in cylinder}}{\text{2 litres per minute needed}} = 170$ minutes available (2 hours 50mins)

Remember: Check for leaks. Take more than the calculated amount as additional supply in case of an emergency (half as much again)

7. PREPARE VENTILATOR
   - See GUIDELINES FOR ASSEMBLING A DRY CIRCUIT and GUIDELINES FOR SAFE USE OF BATTERY PACKS AS WELL AS MANUFACTURES GUIDELINES

Waste Management

- Ensure suction catheters are

NOTE

- **Whilst on an outing be aware of loose connections**
- **REMEMBER, you might not hear the alarm going off; keep an eye on the child and the ventilator.**
- **Secure all lines and tubing to the chair that they cannot get 'trapped' and are unreachable for the child.**
- **Ensure the child's safety by assuring manual respiratory support available or allowing self ventilation as appropriate.**

APPENDIX 7
NAME: ********** DOB ********** NHS No **********
Date

Example of Care Pathway for Management of Acute Illness

Symptoms that should precipitate further treatment at home
Chesty cough
Temperature
Poor/disturbed sleep pattern
Reduced appetite
Feeling non-specifically unwell – no other identifiable cause

Action: Commence home care plan as below

Initial Home Care Plan

- Achieve and maintain apyrexia with paracetamol.
- Start oral antibiotic treatment
- Encourage coughing and deep breathing
- Start NIV for short periods (1-2 hours at a time) during the day with an IPAP of 14, EPAP of 5
- Monitor Transcutaneous Carbon Dioxide (TcCO2) and Oxygen Saturations (SaO2)

Action: If no improvement within 24 hours or if more worrying symptoms develop step up home care as below

More alarming symptoms
Difficulty in breathing
Increased secretions/sputum
Difficulty clearing secretions
Altered breathing pattern
Rapid deterioration
Colour change / Low O2 Saturation <93%
Headaches / High TcCO2 > 8 kpa
Lethargy/drowsiness
Difficulty speaking
Poor fluid intake

Step up Home care

- Increased use of NIV through day and overnight

- Increase IPAP as high as ****** will tolerate during day (up to max 18)
- Increase IPAP at night according to TcCO2 readings (up to a max 22)
- Inform local specialist nurse/ hospital

Action: If no improvement after 24 hrs, or further deterioration then ****** needs admission to hospital. Make sure the ventilator and humidifier is brought to the ward with you.

Additional Support in local Hospital

***** needs a careful review looking for the symptoms/signs listed in his 'home care' plan.

First Line Management
Start IV antibiotics
Consider IV fluids and nutrition
Urgent chest physio using NIPPV to increase effectiveness
CBG and CXR

If there is evidence of altered conscious level, fatigue, fainting, sweating, shallow breathing, development of an O2 requirement during the day or parental concern then move to Second Line Management.

Second Line Management
Increase use of NIV up to 18 hours/day
Consider increasing IPAP to a maximum of 20 during day and 24 at night, increase EPAP to 6
Use additional O2 to maximum of 4 litres via circuit.
Contact Dr Chetcuti on 0113 3923622, or Sarah Cozens on 0113 3923220, or PICU team on 0113 3927102 to inform them of *****'s condition and discuss further management
If no improvement in 24 hrs or criteria for ICU admission are met then transfer for more intensive management is required

Criteria for Admission to PICU/HD

1. Evidence of
   Lethargy/altered conscious level
   Fatigue
   O2 > 4 litres/min to maintain O2 sats
   TcCO2 > 8 kpa on ventilation
   Altered Blood gases

Which fail to respond to treatment locally within 6 hrs

2. Non specific symptoms which fail to respond to treatment within 24 hrs
3. Use of NIV for more than 18 hrs continuously

Contact PICU team to arrange transfer to Leeds or other appropriate facility.

Reviewed November 2006

Pathway produced with Thanks to Dr AM Childs Consultant Paediatric Neurologist and Lindsey Pallant Senior Physiotherapist Leeds Neuromuscular Team in conjunction with Sarah Cozens Children's LTV Nurse Specialist LGI and Martin Latham Respiratory Nurse Specialist SJUH

Bradford and Airedale Community Health Services

Appendix 8 Example of a care plan

Children's Community Specialist Services
CARE PLAN

Name of Child	
DOB	
NHS Number	
Named Nurse	
Date	

Period of review: **Review date:**

Date	Aim of Identified care need	Signature
	…… requires overnight ventilation via ……., to maintain intermittent positive pressure To undertake procedure safely and in accordance with Trust guidelines	

Date	Plan of Care	Signature
	<u>……. prescribed settings are:</u> **Peak Pressure =** **Inspired Time =** **Peep Pressure =** **Expired Time =** **High Flow Alarm =** **Low Flow Alarm =** **Trigger =** **SEE MANUFACTURES GUIDELINES FOR MORE INFORMATION. See Team Policy document.** • Prior to procedure wash & dry hands in accordance with local PCT hand hygiene policy. • Place the ventilator on a clean and level surface. Open the lid to access the mains cable. Connect the socket to the IEC Connector on the side panel. • Plug into the mains power supply.	

	• Check that the Input Air Filter is clean in accordance with manufactures instructions. • Connect the breathing circuit tube to the outlet. • Ensure humidifier is connected appropriately and switch on a. Water chamber is filled to correct level b. Circuit connected to ventilator c. Temperatures set to…….. • Switch on ventilator as described in user manual. • Carry out alarm tests as described in user manual. • **Note:** If any of the alarms fail to operate, **DO NOT USE contact nurse on call** for advice. • Use spare ventilator if appropriate. • Switch on the ventilator power switch. • The alarm will sound. • Ensure the High & Low Flow alarm and Trigger match ……..prescription • Ensure the Inspiratory & Expiratory times and Peak & Peep pressure match the prescription. • Attach the swivel elbow is fitted on the breathing circuit. • Ensure …….. is comfortable • Attach breathing circuit to …….. i.e tracheostomy, • Monitor and document readings every…… • Ensure circuit is placed below the patient and not above as this will cause backflow of water back to the patient. • Wash & dry hands in accordance to local PCT hand hygiene policy. **Contact Childrens Community Team to speak to a qualified nurse for advice and support**	

Signature of Nurse: _____ Date _____
Signature of Parent: _____ Date _____
Please note signature of nurse and parent / carer indicates that the care has been negotiated.

Appendix 9

The Leeds Teaching Hospitals NHS
NHS Trust

VENTILATION TEACHING PACK

Sarah Cozens
Children's Long Term Ventilation Nurse Specialist

Nicola Martin
Children's LTV Nurse

Having completed this booklet, you will have a working knowledge of the functions of the respiratory system and use of long term ventilation.

The organs of the respiratory system include the

- **Nose** hairs and folds in the nose filter and humidify the air we breathe

- **Pharynx** includes the tonsils and adenoids

- **Larynx** the 'voice box' routes air and food into the proper channels and plays a role in speech

- **Trachea** lined with hairs and folds which propel mucus, loaded with dust particles and other debris, away from the lungs to the throat where it can be swallowed or spat out.

- **Bronchi** the right and left primary bronchi are formed by the division of the trachea. The bottom of the trachea is called the carina. The bronchi divide into many branches which take air to different areas in the lung. The smallest of these passages are called **bronchioles** and each one ends at an **alveoli.**

- **Lungs** which contain the **alveoli**. The two lungs occupy most of the thoracic (chest) area. The heart lies between them in the mediastinum (central area). The left lung has two lobes and the right lung three. The walls of the thoracic cavity and the surface of each lung has a lining called a pleural membrane. These produce a slippery secretion which allows the lungs to glide over the thorax wall during breathing.

- **Alveoli** every bronchiole ends with an alveoli. Each alveoli lies next to a small blood vessel and the walls of both the alveoli and the blood vessel are very thin. Oxygen is able to pass across the walls into the blood stream, and carbon dioxide is able to pass out of the blood stream into the alveoli, where it is breathed out.

HOW DO WE BREATHE?

MECHANICS OF BREATHING

Inspiration: The intercostals muscles, between the ribs, contract, lifting the ribcage up and out. The diaphragm contracts pushing down into the abdominal cavity. As the volume in the lungs increases it creates a negative pressure; i.e. the air pressure inside the thoracic cavity is less than the air pressure outside. Therefore air is sucked into the lungs and we breathe in.

Expiration: In healthy people this is a passive process. The intercostals muscles and diaphragm relax and lung volume decreases. As pressure inside the lung cavity increases air is forced out.

CONTROL OF RESPIRATION

All breathing activity is regulated by nerve impulses transmitted to them by the brain from the **phrenic** and **intercostal** nerves. The rate and rhythm of breathing is mostly determined by the levels of carbon dioxide in the blood. As levels increase in the bloodstream we breathe faster thus getting rid of excess waste.

HOW CHILDREN DIFFER

Children are different from adults, their lungs and ribcages are still growing and this changes the way they breathe. Adults use the muscles between their ribs to breathe, however, children use their diaphragm. Children's bones are generally softer than adults due to the fact that they are still forming and growing, therefore their chest walls are softer and more pliable.

The airways and alveoli continue to develop until about 8 years old. This means they have fewer alveoli, and narrower and softer airways. Because their airways are smaller children are at greater risk of having trouble breathing due to secretions blocking or reducing the air getting to their lungs. Children have fewer reserves than adults and therefore react more quickly when they have difficulty breathing.

HOW VENTILATION WORKS

If a child is unable to breathe adequately for themselves then they can be assisted using mechanical ventilation. This pushes air (with or without oxygen added) under pressure into the lungs.

A child can receive help with breathing either through a mask or through a tube. These tubes can be oral (via the mouth), nasal (via the nose), or tracheal (see attached tracheostomy teaching pack). The patients who are long-term ventilated will either have mask or tracheal ventilation as these are the most comfortable.

Terms used in ventilation

TV – Tidal Volume
- The amount of air taken in one breath
- Measured in mls

Rate – The number of breaths taken in a minute
- Can be set on the ventilator or spontaneous

MV – Minute Volume
- The amount of air taken in during a minute
- Measured in mls
- Calculated by TV x rate

IPAP - Inspired Positive Airway Pressure
-The top pressure to which air will be delivered into the lungs during inspiration

EPAP - Expired Positive Airway Pressure
-The bottom pressure to which lungs are allowed to exhale
-Also known as PEEP (Positive End Expired Pressure)

Ti - Inspiratory Time

-Time over which inspiratory breath is given

Trigger – The sensitivity to which the ventilator is set to detect a patients spontaneous effort at breathing
- The lower the number the more sensitive the ventilator
- Once detected the ventilator will then deliver a supported spontaneous breath

Types of Ventilation

- IPPV
  - Intermittent Positive Pressure Ventilation
  - Set IPAP and Ti
  - Timed inspiratory breath triggered by the patient
  - No EPAP, patient breathes out to atmospheric pressure via exhalation port

- BiPAP (Pressure Control)
  - Biphasic Positive Airway Pressure
  - Set IPAP, EPAP and Ti.
  - Breaths triggered by the patients respiratory effort
  - Back- up rate takes over in the absence of spontaneous effort

- BiPAP (pressure Support)
  - Biphasic Positive Airway Pressure
  - IPAP, EPAP and back-up rate set
  - Combines a set rate with spontaneous breathing. Any spontaneous breaths are assisted to a pre-set upper pressure limit
  - The set rate does not have to be given but acts as a back up rate if the spontaneous rate drops
  - Ti will be given as: half of the back-up rate (timed breath), or a half of the back-up rate up to 2 seconds (spontaneous supported breath)

– CPAP (Continuous Positive Airway Pressure)
  - Spontaneous breathing with set PEEP
  - No back-up rate or inspired pressure

VENTILATOR CIRCUITS

Different types of ventilator circuits are used depending on where the patient is and what activity they are doing. When a person is ventilated via a tracheostomy the air given bypasses the upper respiratory tract, therefore it is not warmed and humidified. This could cause secretions to dry and become sticky and make breathing uncomfortable. Therefore, all air going to the patient must be humidified either via a humidification unit such as the **Fisher Paykel**, or via a heat and moisture exchange filter (**HMEF)**. If required Oxygen can be given through any circuit.

WET CIRCUIT

The **fisher paykel** uses a bag of sterile water which is warmed by dripping onto a heated plate. This then warms and humidifies air flowing to the patient. The ventilator circuit used with this system contains a heater wire that keeps the air warm along the circuit. A sensor from the humidifier attaches at the patient end of the circuit; this reads the temperature that the air is as it reaches the patient, and alters the temperature in the humidifier so that the air reaching the patient is at a constant. Further explanation of the fisher paykel humidifier can be found in the PICU resource file. As the humidifier requires a constant electrical supply this system can only be used whilst the patient is staying still, i.e. either resting in bed or happy to stay within the confines of the ventilator tubing.

An exhalation port must always be attached close to the tracheostomy. Without one the patient cannot breathe out. A catheter mount, such as a 'swivel elbow', should be attached at the tracheostomy to allow the patient freedom of movement and prevent accidental disconnection.

A bacterial filter sits between the ventilator and the start of the tubing. This prevents dust and particles from being breathed in, therefore acting as an additional part of the patients upper respiratory tract. It also prevents water from the humidifier entering the ventilator. The filter must be changed daily.

DRY CIRCUIT

The **HME** filter is normally used when the patient is attached to a portable, or dry, circuit. Instead of humidifying the air the filter uses heat and moisture gained from the patients own expiratory breath to warm and humidify their inspiratory breath. Therefore the filter must be attached close to the patient (between the swivel elbow and the exhalation valve). An exhalation port must always be attached close to the tracheostomy. Without one the patient cannot breathe out. The dry circuit attaches directly to the ventilator, the HMEF negates the need for a bacterial filter. The HME filter comes in 3 different sizes, neonate, child and adult. It is important that the correct size is used for your patient to prevent over, or under, humidification. The HME filter must be changed every day. The dry circuit needs to be changed weekly.

Guidelines for changing humidified circuit

The humidified ventilator circuit must be changed once a week to prevent bacterial build-up which could lead to a chest infection. The dates for the due change are indicated on the 'monthly to do' chart. It is important to remember that your patient may not be able to breathe by themselves while you change the circuit so they will either have to be manually ventilated (bagged) or will be attached to a second circuit. Depending on the patients' stability and the staff's expertise the procedure can require either one or two people. See Ventilation Guidelines.

BATTERIES

The batteries will need charging after use. Battery life varies, however, the most commonly used will last either four or eight hours. It is important to keep all spare batteries charging to ensure that the patient has as much freedom as possible. The battery packs ideally need charging for 16 hours before each use. When going out it is worth taking a spare battery in case of delays or malfunction. You can take a partially charged battery as back-up but bear

in mind you will not know how long it will last. Battery status should be checked with every handover or at the start of every shift. See Ventilation Guidelines.

EMERGENCY BAG/ BOX

Every child with a ventilator should have a bag with them at all times containing a complete kit to deal with any respiratory problem. This is normally hung over the back of their chair and accompanies them EVERYWHERE. The kit should be checked at the start of every shift and topped up from stock as required. It comprises:

- Ambu-bag with oxygen tubing attached.
- Same size spare tracheostomy tube with introducer and Velcro tapes attached
- Size smaller tracheostomy tube with introducer
- Spare tracheostomy tapes
- wedge (for bivona tracheostomy tubes only)
- 2x aqua gel sachets.
- Round ended scissors
- 5x syringes
- 5x sterile ampoules saline
- Copy of resus flow chart for child with tracheostomy (appropriate to age).
- Yankeur sucker

CHANGE OF SHIFT CHECKLIST

To ensure the child's safety and ensure that the ventilator and related equipment works effectively certain checks should be carried out at the start of each shift. These checks are recorded on either the daily or monthly checklists found in the child's file:

- Tracheostomy tapes- check clean and secure
- Ventilator circuit- clean and connections secure
- Ambu-bag- Intact and attached to oxygen (if required)
- Oxygen- cylinders ¼ full, 15ltr heads cylinder and 4ltr concentrator cylinder present (if concentrator used). All necessary oxygen tubing present and intact. Cylinders should be turned off if not in use, however, if turned off, should be turned on and run briefly at 10 litre to check level and then turned off. Level will drop quickly if cylinder empty and reading high.
- Ventilator- check settings and alarms on ventilator in use and on spare.
- Humidifier (if in use) - check settings and water bag.
- Batteries- how many, status and charging.
- Suction- charging and working @ 120mmhg. Need to carry out same checks on spare.
- Pulse oximeter- check alarm limits if in use
- Emergency bag contents

OBSERVATIONS AND MONITORING

Every ventilated child should have at least one set of observations carried out each shift. Normally this can be performed at the start with the checklist. This should include:

- Pulse
- Respiratory rate
- IPAP
- EPAP
- Ti
- Set rate (if applicable)
- Humidifier temperature (if applicable)
- Sa02
- Fi02
- Ventilator alarm limits

Each time physio or suction is required this will need to be recorded as will whether or not nebulisers or saline are required. Temperature is recorded if indicated and monitored depending on the child's health. Tidal volume can be recorded but is often inaccurate due to the leakage around the tracheostomy.
If the child is awake, after an initial set of observations, continuous monitoring is not normally required. However, pulse-oximetry is advised if the child is ever left alone, or while the child is asleep and especially overnight (darkened rooms make it difficult to observe colour).
Frequency of observations and monitoring are fluid, and are entirely dependent on the child's health on your shift and on the carers' peace of mind and knowledge of that particular child. If the child is unstable, observations should be carried out whenever changes in care are made.

ALARMS

Power Fail: If the power supply to the ventilator is interrupted an alarm will sound. This will continue for five minutes unless cancelled with the mute button.

Low External Battery: When using the external battery the alarm will sound when there is approximately 10 minutes of running time left. However, this time is not guaranteed and an alternative power source should be found promptly. It will also alarm if it self discharges to approximately 75% of its capacity during standby.

High Pressure: If the pressure rises above 120% of the working pressure an audible and visual alarm will start.

High Flow Alarm: Acts as an adjustable disconnect alarm. If the ventilator has to give air flow over the limit set to try to achieve the set pressures an audio and visual alarm is activated. Potential causes include: patient disconnection or circuit disconnection/ failure.

Low Flow Alarm: Acts as an adjustable blockage alarm. If the ventilator has to give air flow under the limit set to achieve the set pressures an audio and visual alarm is activated. Potential causes include: secretions, blocked tracheostomy tube and circuit occlusion.

Fault: if triggered by a fault within the machine this will be displayed on the screen and stored in the fault log.

Low Internal Battery: An intermittent alarm with no onscreen message indicates a depleted mains fail alarm battery. This can happen if the ventilator is stored for more than a few weeks without being plugged in; this allows the internal battery to self discharge. The alarm will stop once the battery has been recharged, i.e. once the ventilator has been plugged back in.

If the alarm does not stop you will need to contact Sarah Cozens to get the ventilator temporarily replaced.

ACTION

When any alarm sounds the first action must be to assess the patients safety and condition. If in any doubt it is advisable to remove the ventilator and commence hand ventilation using the ambu-bag. If the problem is not immediately apparent it is best to start your assessment from the patient, and work back to the ventilator.

CONTACTS

Remember, you are never by yourself!
Sarah Cozens is contactable during the week (0113 3923220 / 07899988712)
Or Martin Latham (Leeds Sleep Service - 0113 2066040)
The child's community team leaders will have day contact, and on-call numbers in the community file.
In emergencies, LGI PICU will answer at any time of the day or night 0113 3927102.

APPENDIX 10
COMPETENCIES FOR CARE OF A CHILD ON VENTILATION

Bradford and Airedale Community Health Services

NAME:…….
Update due…….

	Attend theory Signed	Practical Assessment Date/Signature	Practical Assessment Date/Signature	Practical Assessment Date/Signature	Practical Assessment Date/Signature	Practical Assessment Date/Signature	Practical Assessment Date/Signature
ATTEND THEORY SESSION							
DEMONSTARTE KNOWLEDGE OF INFECTION PREVENTION; **Hand hygiene** **Standard precautions** **Personal Protective Equipment**							
DEMONSTRATE HOW TO SWITCH ON AND SET UP VENTILATOR WITH APPROPRIATE CIRCUIT WITH/WITHOUT HUMIDITY							
DEMONSTRATE HOW TO USE VENTILATOR WITH BATTERY PACK							
DEMONSTRATE KNOWLEDGE OF ALARMS AND TROUBLESHOOTING							
DEMONSTRATE HOW TO CARRY OUT & RECORD SAFTEY CHECKS							

DEMONSTRATE HOW TO CHECK & RECORD/ DOCUMENT SETTINGS							
DISCUSS WHEN MANUAL VENTILATION MAY BE REQUIRED & WHAT COMPLICATIONS MAY ARISE							

Adapted from Cozens S. (2006) Ventilation Document Paediatric Intensive Care Unit LTHNHST
www.longtermventilation.nhs.uk
CHILDRENS COMMUNITY TEAM (ER 3.06)

PERSON(S) RESPONSIBLE FOR TRAINING

- **LEEDS VENTILATION NURSE SPECIALIST**
- **QUALIFIED NURSE WHO HAS UNDERGONE THE APPROPRIATE TRAINING**

Appendix 11 **CHECKLIST FOR OVERNIGHT VISITS**

	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Equipment												
Ventilators + Leads x2												
Humidifier												
Battery + charger x2												
Suction + charger x 2												
Nebuliser Pump												
Feed pump + Lead												
Saturation monitor												
Milk feeds												
Drugs + Chart												
Inhaler aerochamber												
Oxygen cylinders												
Decontamination wipes& hand hygiene												
Vent Circuits												
Documentation												
Sign												

DRAFT

©BACHS 2010

Appendix 12
EQUALITY IMPACT ASSESSMENT

Stage One: Screening of a policy, procedure, tender or strategy

1. Name of policy, procedure, tender or strategy. **Is it a policy, strategy, procedure or practice?**	Guidelines for children in the community on long term ventilation	**2. Who has been consulted?**	• Associate directors • Heads of Service and staff in all BACHS business units • Head of programmes and the information governance manager • Designated nurse child protection • Equality and diversity team • NHSBA, via the head of nursing & professional development Members of the following committees: • Clinical risk and governance sub-committee • Professional advisory sub-committee • Non-clinical policy group • Infection control committee • Health and safety operations group
3. Main aims	To ensure that BACHS staff have clear guidance to support client caseload: • promote safe and effective clinical and management practice • comply with relevant legislation, alerts and directives • are developed in accordance with an agreed process	**4. How has the policy been explained to those most likely to be affected?**	Direct responses made to questions raised at consultation.

©BACHS 2010

	• are user friendly, relevant and workable in practice.		

Collecting and collating existing information and data

Please indicate in the table below whether the policy, strategy, procedure or tender has the potential to impact adversely on the equality target groups			
Equality target group		**1. Is the policy *likely* to have a <u>potential</u> differential impact with regards to the equality target group listed?** **0 = no** **1 = little** **2 = medium** **3 = high**	**2. How have you arrived at the conclusions in box 1?** **i. Who have you consulted? (appropriate individuals/groups internally and externally)** **ii. What have they said?** **iii. What information/data have you interrogated? (library search, complaints data, PALS, research reports, local studies, advice from internal and external specialists)** **iv. Where are the gaps in your analysis?** **v. How will your paper promote the equality duties if they apply?**
Age	**Older people** **Young people** **Children** **Early years**	0	*This document has been consulted by regional Childrens community teams who support similar children*
Disability	**Sensory disabilities** **Physical disabilities** **Learning disabilities** **Mental health**	0	as above

©BACHS 2010

Gender	**Men** **Women** **Transgender**	0	as above
Race	**Minority ethnic communities** **Gypsies and travellers**	1	Travellers who are on the caseload may leave at short notice and care may be affected if support not coordinated to follow them at next destination.
Religion or belief	**Christian** **Muslim** **Hindu** **Buddhist** **Sikh** **Jew** **Other**	0	as above
Sexual orientation	**Lesbian** **Gay men** **Bisexual**	0	as above

Summary

Is a more full equality impact assessment required? No
Please describe the main points arising from the initial screening here that support your decision There is no potential adverse impact. Prior to the next review of this policy, the nurse specialist will gather feedback from patients / families who have been receiving this treatment and use their feedback to inform any policy developments.
Policy lead conducting impact assessment: Erky Radic Clinical Lead **Approved by (member of the equality and diversity team): Lynne Carter** **Date:1.11.10**

©BACHS 2010

Appendix 13
PROCEDURAL DOCUMENT CHECKLIST

To be completed by the document sponsor prior to submission to the relevant committee for approval.

Title of document: Guidelines for Children in the Community requiring Long term ventilation

To be submitted to which committee? Professional Advisory Sub committee

		Yes/No	Comments
1.	**Title**		
	Is the title clear and unambiguous?	**yes**	
	Is it clear whether the document is a guideline, policy, protocol or care pathway?	**yes**	
2.	**Introduction**		
	Is the purpose of the document clearly stated?	yes	
	Is sufficient information given to place the document in context?	yes	
3.	**Scope**		
	Is the target population clear and unambiguous?	yes	
	Have any key limitations of the scope been made clear?	yes	
4.	**Key roles and responsibilities**		
	Are key roles and responsibilities clear and unambiguous?	yes	
5.	**Format and style**		
	Does the document comply with the standard format presented in the policy on the development and management of procedural documents?	yes	
	Does the document comply with the style guide?	yes	
	Is the document in plain English?	yes	
	Are abbreviations appropriate and have they been explained?	yes	
	Has the document being spell checked?	yes	
	Has the document been proof read?	yes	

©BACHS 2010

		Yes/No	Comments
6.	**Content**		
	Does the document present information in a clear and logical manner?	yes	
	Are the requirements of the document reasonable and achievable? (eg training and competency, equipment, staff capacity)	yes	
7.	**Evidence Base**		
	Have key sources of information been checked?	yes	
	Has relevant evidence been appraised and used appropriately?	yes	
	Are key sources referenced?	yes	
8.	**Equality impact assessment**		
	Has the equality impact assessment being completed and attached as an appendix?	yes	
9.	**Consultation**		
	Has sufficient consultation been undertaken?	yes	
10.	**Implementation and monitoring**		
	Is it reasonable to expect immediate implementation of this document?	yes	
	Are the stated monitoring arrangements reasonable and achievable?	yes	
11.	**Development and consultation**		
	Is a summary of the document's development and consultation processes attached as the final appendix?	yes	
	Were there any particularly contentious issues to be managed during this process? If yes, how were they resolved or do they remain contentious?	no	

Further comments

This document was checked by document sponsor
Name

Title **Date**

©BACHS 2010